Space Weather Technical Forecast

Issued on Thursday, 04 August 2022 at 13:21 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours with one C-class flare, the strongest reaching C9.2 flare at 03/1708 UTC. This originating from AR3068 Esi/Beta in the southwest. There is one other region, AR3071 Hsx/alpha, in the southeast. The C9.2 flare was accompanied by a type II radio-burst, indicating a possibility of a CME, however currently there is no evidence on available imagery. No other Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: Earth has likely been grazing the High Speed Stream from coronal hole 07, with solar wind speeds, as measured at L1, declining from around 530 km/s to 430 km/s in the past 24 hour period. Density was average throughout. The total interplanetary magnetic field (IMF), Bt was weak, below 8 nT. The north-south component, Bz, fluctuated weakly between +6/-5 nT. The Phi angle was negative (towards the Sun). Geomagnetic activity was Quiet (Kp 1-2).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV), as measured by GOES-16 was at background levels. The high energy electron flux (greater than 2 MeV) was at background. Electron fluence showed an erratic declining trend, remaining well below the Active threshold (1e8 integrated flux), with an observed fluence value of 4.33e6 integrated pfu recorded at 04/0001 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low solar activity is likely to continue, with a slight chance (20%) of an M-class flare.

Solar Wind / Geomagnetic Activity: No CMEs have been assessed as Earth-directed. Slightly elevated solar winds declining during the next 24 hours as Earth exits into the slow ambient regime. Geomagnetic activity should remain mainly Quiet with a chance of Unsettled intervals through the period, and a slight chance of an Active interval, especially on day 3 (6th) with the arrival of a HSS related to the next Coronal Hole.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to remain at background levels. The high energy electron flux (greater than 2 MeV) is expected to remain mostly at background to moderate levels, but with a chance of approaching high levels at the diurnal maxima. The corresponding 24 hour fluence is most expected to remain below the Active threshold (1e8 integrated pfu) but on a steadily increasing trend.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

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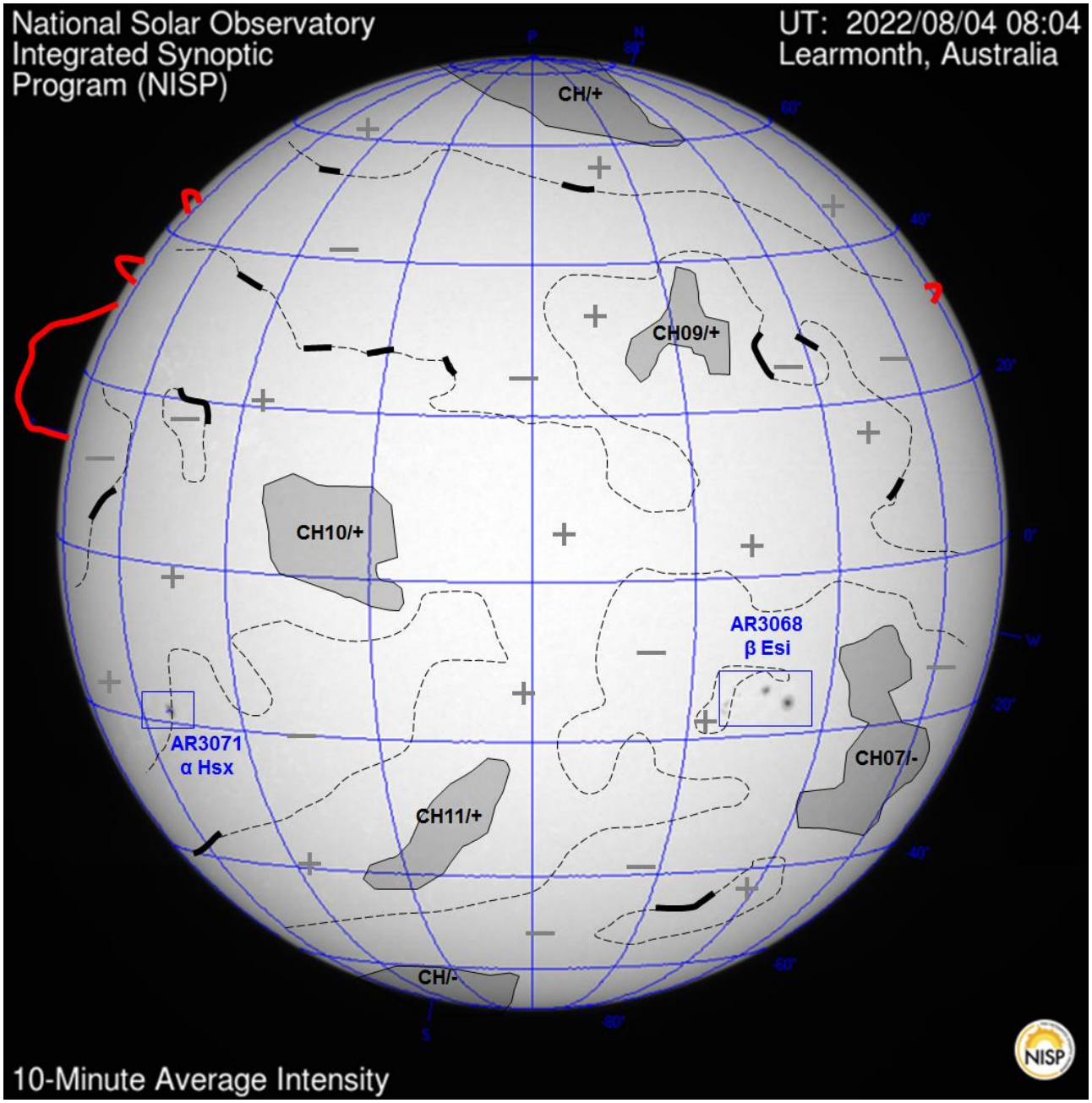
Figure 1. Solar Analysis Valid 0800UTC, 4 August 2022.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No Earth directed CMEs are currently expected and Earth is currently embedded within the High Speed Stream of CH07/- giving elevated solar winds. This is the remains of a previously large northward extension of the southern polar crown. Solar winds starting the forecast period slightly elevated whilst within this high speed stream (HSS), which is currently expected to persist through to late day 1 into day 2 (4th-5th). The next HSS arrival is expected later on day 3 (6th) from CH09/+.

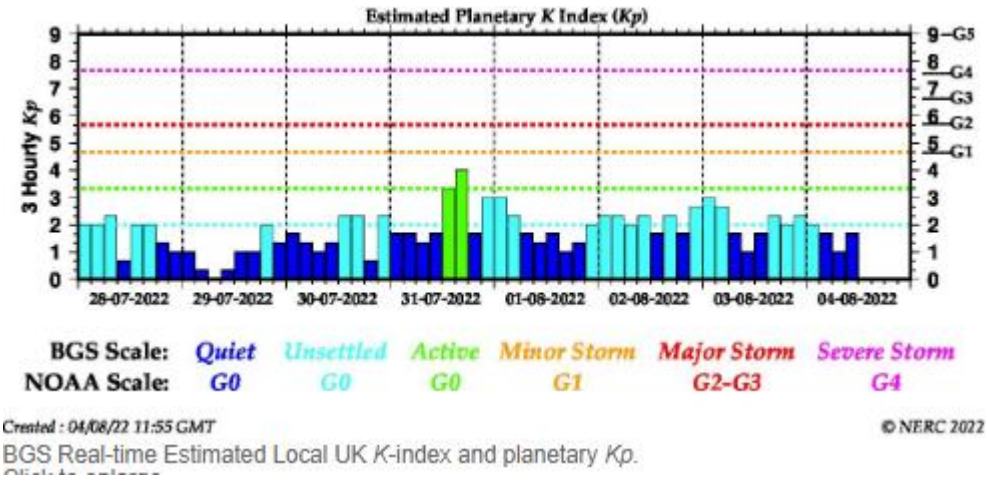
Geomagnetic activity should remain mainly Quiet with a chance of Unsettled intervals through the period, and a slight chance of active interval especially on day 3 (6th) with arrival of the next HSS related to Coronal Hole (CH09/+), perhaps preceded by a CIR (Co-rotating interaction region).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	1	1	10	5
Strong	**G3**	No	1	1	1	1
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

Figure 2: Geomagnetic Activity over the past week with mostly Quiet conditions observed.


Estimated Planetary K Index (Kp)
3 Hourly Kp
9 8 7 6 5 4 3 2 1 0
9 G5
8 G4
7 G3
6 G2
5 G1
28-07-2022 29-07-2022 30-07-2022 31-07-2022 01-08-2022 02-08-2022 03-08-2022 04-08-2022
BGS Scale: Quiet Unsettled Active Minor Storm Major Storm Severe Storm
NOAA Scale: G0 G0 G0 G1 G2-G3 G4
Created : 04/08/22 11:55 GMT
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BGS Real-time Estimated Local UK *K*-index and planetary *Kp*.

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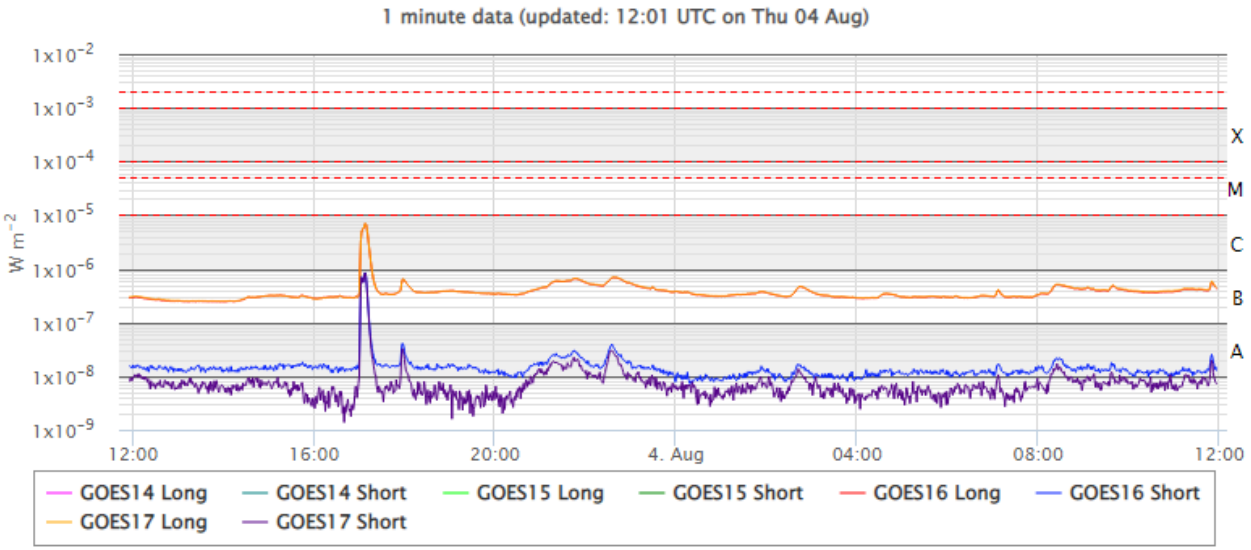
Radio Blackouts - X-Ray Flares:
Solar Activity is currently Low, with only two sunspot active regions on the visible disc. The most prominent is in the southeast, AR3068 Esi/Beta, which has been the source of a C class flare in the last 24 hour period. AR3071 Hsx/alpha is the other region, situated in the southwest disc. Activity is likely to remain Low, with a slight chance of Moderate activity due to any M-flares that may occur, primarily from AR3068. Probabilities in the table above have been lifted later in the period in anticipation for two returning active regions to rotate across the eastern limb.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	20	20	20	30
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: X-ray flux data at GEO during the past 24 hours with one C-class flare observed.



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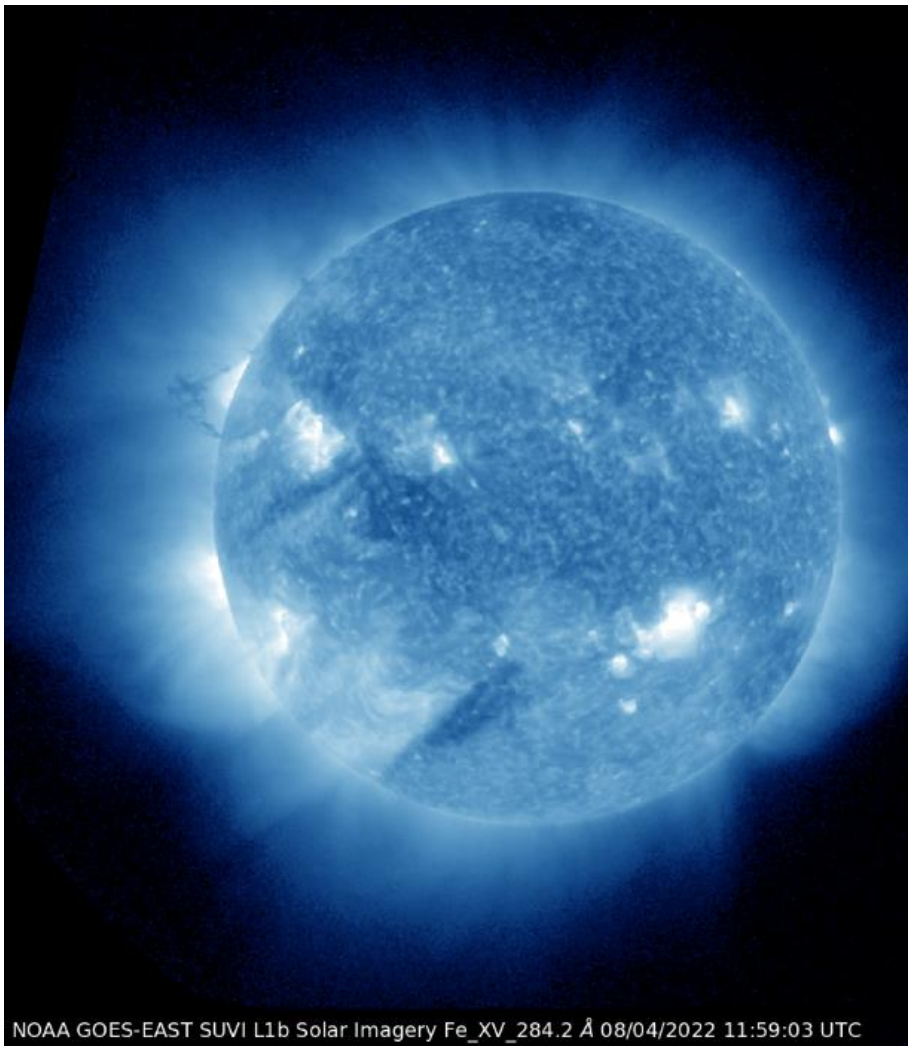
Solar Radiation Storms - (High Energy Protons):
The high energy proton flux (greater than 10 MeV) is currently at Background levels and is expected to remain at this level through the period. AR3068 will need monitoring for any further development, however, with the potential to increase radiation storm risks as it transits across the eastern hemisphere of the solar disc.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

Figure 4: NOAA GOES-EAST SUVI data giving an indication of active regions on the visible disc.



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High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2 MeV) as measured by GOES-16 is initially expected to remain mostly at background levels, but a chance of rising to Moderate levels and perhaps approaching High (1000 pfu) at diurnal peak. This will most likely occur as solar winds ease later on day 1 into 2 (4th-5th).
The associated 24 hour fluence, however, is expected to remain below the Active threshold (1e8 integrated pfu) throughout. While an increasing trend is likely, electron flux levels are currently not expected to persist at High for a sufficiently long period of time to result in fluence reaching Active levels. This is supported by Met Office REFM output which is currently offering good guidance.

GEO Electron Environment Probability (Exceedance)	Level ($cm^{-2}\ sr^{-1}\ day^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	5	10	10	10
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 5: High energy electron flux at GEO and the Met Office REFM output.

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